Chemistry Knowledge Sequencing

By the end of key stage FOUR we want all students of Chemistry to know and do the following key things: Hold confident knowledge & understanding of key terms and concepts in Chemistry; apply to scenarios; give competent description; have thorough practical skills; analyse qualitative & quantitative data with reasoning; manipulate data; draw coherent conclusions; make well-reasoned judgements; evaluate practical procedure with growing independence, link key concepts

Prior Knowledge	In KS4, students of Chemistry will build on the following prior learning: KS3 knowledge and understanding, ability to think scientifically, appreciation of key practical methods; awareness of variables; KS3 mathematical skills, awareness of the purpose of evaluation; justified conclusion; analysis of data with description of trends; key apparatus and techniques; appreciation of lab safety and safe use of chemicals
Future Knowledge	The Curriculum in KS4 Chemistry will prepare students for the following future learning: Confident knowledge & GCSE understanding; application to wider scenarios, such as Chemistry in Industry and Chemistry of the Earth; depth of description; high competency for practical skills; analysis of qualitative & quantitative data with reasoning; manipulation of data; coherent conclusions; well-reasoned judgements; evaluate & refine practical procedure independently, link key concepts.

	Term	**Key Knowledge**	**Assessment Focus**
Year 10	1	Understanding and application of Electrolysis. Links to use in everyday life, such as extracting metals from their ores. Required practical: Electrolysis	Extracting aluminium LAQ Electrolysis test
	2	Understanding and application of quantitative chemistry. Mathematics skills: unit conversions; rearranging equations. Applying quantitative analysis to examination questions. Links to quantitative use in industry; % yield/atom economy	Making copper chloride LAQ Titration LAQ Chemical calculations midtopic test Chemical calculations test
	3	Understanding and application of quantitative chemistry. Required Practical: Acid-base Titration – developing practical skills unfamiliar equipment. Mathematics skills; unit conversions; rearranging equations. Applying quantitative analysis to questions.	Energy changes LAQ Energy changes test
	4	Consolidation of prior learning in preparation for mock examination. Modelling application of understanding to unfamiliar questions. Review and feedback of understanding through mock exam analysis	Year 10 assessment
	5	Understanding and application of chemical reactions and their rates. Practical skills, graph skills, data handling, maths skills. Linking subject to careers. Application of theory to practical. Testing hypothesis. Understanding of variables	Rate of reaction LAQ
	6	Understanding and application Energy & Equilibria. Importance in everyday life (Haber Process/Fuel Cells). Maths Skills in energy calculations. Linking concepts; compromise between rate and yield. Required Practical: recording temperature changes. Mathematics: graphs skills.	Rates and equilibria test
Year 11	Term	**Key Knowledge**	
	1	Understanding & application of Carbon Chemistry. Links from Geography/KS3 source of oil, building upon knowledge to link to uses.	Fractional distillation LAQ Chemical analysis test

	2	Consolidation of prior learning in preparation for mock examination. Modelling application of understanding to unfamiliar questions. Review and feedback of understanding through mock exam analysis	Year 11 assessment
	3	Understanding the history and chemistry of the atmosphere. Required practical: Distillation, the purification of water.	History of the atmosphere LAQ Chemistry of the atmosphere test
	4	Understanding and application of the chemical tests. Required Practical: Linking chemical testing to potable water topic. Recall of prior learning (Chemical Formulae and Ions). Practical skills and analysis of unknowns – systematic identification. Consolidation of prior learning in preparation for mock examination. Modelling application of understanding to unfamiliar questions. Review and feedback of understanding through mock exam analysis	Water treatment LAQ Using resources test
	5	Consolidation of prior learning and application to exam questions in preparation for external exams through use of past paper questions.	External examinations
	6		

Opportunities for developing literacy skills and developing learner confidence and enjoyment in reading	**Links to British Values**	**Links to Careers**	**Links to Other Personal Development**
FROM THE LIBRARY *Energy And Chemical Change*-540 *Heat And Combustion*-540 *Hydrogen and The Noble Gas-540* *Elements Compounds and Mixtures-541* *Acids Bases and Salts-546* *Air and Water-546* *Chemicals in Action-546* *Periodic Kingdom-546.8*	**Mutual respect:** Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints respectfully. **Rule of law:** When conducting practical work, we have to follow rules about Health and Safety to ensure the safety of everyone in the laboratory. When conducting experiments involving animals, we have to abide by laws to ensure that animals are not treated cruelly.	Links to a broad range of careers are made at the start of each new topic area. They are given to students on their learning objectives sheets and projected on the introductory slide of each new topic.	• Developing a healthy lifestyle. • Developing healthy relationships. • Develop a set of positive personal traits, dispositions and virtues that informs their motivation and guides their conduct so that they reflect wisely, learn eagerly, behave with integrity and cooperate consistently well with others. • Develop confidence, resilience and knowledge so that they can keep themselves mentally healthy.

Principals of Organic Chemistry-547 *Air Pollution: Our Impact on the Planet-363.7* *Environmental Hazzards-363.7* *Global Climate Change-363.7*	When using radioactive sources, certain members of the department are trained as Radiation Protection Supervisors to comply with Health and Safety laws. **Tolerance:** Throughout the Science curriculum, scientists from different backgrounds will be discussed, including the challenges they faced because of their beliefs, viewpoints and protected characteristics. When discussing contentious issues, for example theories about the formation of the Universe, all viewpoints are considered while teaching the scientifically accepted ideas. Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints. **Democracy:** Science is a democratic discipline. When developing new theories, it has to be accepted by a wide number of scientists before it is consider a scientific		• An inclusive environment that meets the needs of all pupils, irrespective of age, disability, gender reassignment, race, religion or belief, sex or sexual orientation.

	theory. Similarly, all experimental work has to be peer reviewed by others before it is accepted. **Individual liberty:** Students have opportunities that will allow them to use their knowledge and understanding to pose scientific questions and define scientific problems. Students are introduced to the idea that Science cannot provide the answers to some questions, for example, where beliefs, opinions and ethics are important.		
Extra-Curricular and Co-Curricular Opportunities	**Links with other subjects in the curriculum**		
Lego league Rotary tech challenge Arkwright scholarship Nancy Rothwell award competition Science week activities and poster competition. Kerboodle – additional resources and textbooks Educake	Maths - classifying, counting, measuring, calculating, estimating, tables, graphs, statistics, algebra Geography – Combustion, pollutants, environmental impacts, clean drinking water, product life cycles, climate change. History – structure of the atom, periodic table. Design and technology –properties of metals and metal alloys. Personal development – social and cultural contributions of scientists such as Haber. English and MFL: etymology of words		

Chemistry Knowledge Sequencing

By the end of key stage FIVE we want all students of Chemistry to know and do the following key things: Hold confident knowledge, understanding, and application of core Chemistry terms and concepts; give depth of description; hold high competency for practical skills; analyse and manipulate qualitative & quantitative data with reasoning; draw coherent conclusions; make well-reasoned judgements; evaluate & refine practical procedure independently.

Prior Knowledge	In KS5, students of Chemistry will build on the following prior learning: GCSE knowledge and understanding of topics such as Organic Chemistry, mole calculations, rates of reactions and chemical analysis; build on experience of practical procedures; justification of processes and variables; GCSE mathematical skills, including evaluation of data; offer extended responses, justified conclusion, and explanations of trends; key apparatus and techniques; appreciation of laboratory safety and safe use of chemicals
Future Knowledge	The Curriculum in KS5 Chemistry will prepare students for the following future learning: Undergraduate study in areas such as Medicine, Biomedical Sciences, Chemical Engineering, Biochemistry, Dentistry and Pharmacy; understanding beyond specification; appreciation of wider reading and linked theory; independent research skills; independent practical investigation; collection and manipulation of quantitative data.

	Term	Key Knowledge	Assessment Focus
Year 12	1	Understanding and application relating to amount of substance, acids, atomic structure and bonding. Complete Practical activity one: Titrations.	Common practical assessments Fundamental particles test and Bonding test. Amount of substance test.
	2	Understanding and application of alkenes, polymers, enthalpy changes and Hess's law. Manipulation of data for enthalpy changes and practical work on calorimetry. Complete Practical activity two: Enthalpy	Y12 assessment Shapes of molecules test and Alkanes test. Energetics test
	3	Understanding and application of titrations, alkanes, basic concepts, periodicity, Groups 2 and 7. Analysing trends with explanations, practical skills; and quantitative data manipulation. Complete Practical activity three: temperature and rate of reaction and Practical activity four: Identifying cations and anions.	Organic reactions and mechanisms test. Periodicity test.
	4	Understanding and application of rates, equilibria, and alcohols. Consolidation of prior knowledge in preparation for interim examination. Calculations involving rates and equilibrium. Complete Practical Activity five: distillation of a product from a reaction.	Alcohols test
	5	Practise of prior learning through consolidation exercises and booklets in preparation for interim mock examinations. Understanding and application of core knowledge relating carbonyls, carboxylic acids, esters, and spectroscopy. Complete Practical Activity six: Tests for alcohol, aldehyde, alkene and carboxylic acid.	Y12 interim examinations Identification of organics test
	6	Understanding and application of equilibria and kinetics. Calculations for equilibria and kinetics. Understanding and application of aromatic and nitrogen compounds and their derivatives. Knowledge of chemical reactions and conditions including mechanisms. Practise of prior learning through consolidation exercises and booklets in preparation for interim mock examinations. Complete Practical Activity seven: experimental determination of the rate.	Y12 interim examinations NMR test Rates and equilibrium constant test

	Term	Key Knowledge	
Year 13	1	Understanding and application of polymers, synthesis, with analytical techniques, thermodynamics to include born-haber cycles and entropy. Problem solving, interpretation of data and application to unfamiliar scenarios. Complete Practical Activity Group ten: preparation of an organic solid and an organic liquid.	Acylation and amines test Thermodynamics test.
	2	Understand electrode potentials, writing half equations, constructing overall cell equations, using cell notation and the application for real worls cells. Data handling, analysis, evaluation, and manipulation. Understanding and application of acids and bases. Complete Practical Activity eight: measuring the EMF of an electrochemical cell.	Y13 assessment. Aromatics test and Polymers test.
	3	Understanding and application of buffers, titration curves and energy. Understanding and application of transition metals, and redox potentials. Calculations involved with acids, bases, and buffers. Complete Practical Activity twelve: separation of species by thin-layer chromatography. Practise of prior learning through consolidation exercises and booklets.	Y13 assessment. Natural polymers and organic synthesis test.
	4	Consolidation of prior learning in preparation for mock examinations. Calculations and practical work involving electrode potentials and redox titrations. Practical Activity Nine: investigate how pH changes and Practical Activity eleven: identifying transition metal ions.	Acids and bases test.
	5	Consolidation of prior learning and application to unfamiliar scenarios in preparation for external exams through use of past paper questions.	External Examinations
	6		

Opportunities for developing literacy skills and developing learner confidence and enjoyment in reading	Links to British Values	Links to Careers	Links to Other Personal Development
Books The Pleasure of Finding Things Out - Richard Feynman Periodic Tales - Hugh Aldersey-Williams The Disappearing Spoon - Sam Kean Uncle Tungsten - Oliver Sachs The Shocking History of Phosphorus: A Biography of the Devil's Element - John Emsley	**Mutual respect:** Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints respectfully. **Rule of law:** When conducting practical work, we have to follow rules about Health and Safety to ensure the safety of	• Higher education opportunities signposted in lessons, on Teams and permanent displays. • Pupils are regularly supported and provided with guidance on necessary grades required for University courses and subsequent careers.	• Developing a healthy lifestyle. • Developing healthy relationships. • Develop a set of positive personal traits, dispositions and virtues that informs their motivation and guides their conduct so that they reflect wisely, learn eagerly, behave with integrity and cooperate

Magazine/Journals Scientific American New Scientist The Mole Chemistry Review	everyone in the laboratory. When conducting experiments involving animals, we have to abide by laws to ensure that animals are not treated cruelly. When using radioactive sources, certain members of the department are trained as Radiation Protection Supervisors to comply with Health and Safety laws. **Tolerance:** Throughout the Science curriculum, scientists from different backgrounds will be discussed, including the challenges they faced because of their beliefs, viewpoints and protected characteristics. When discussing contentious issues, for example theories about the formation of the Universe, all viewpoints are considered while teaching the scientifically accepted ideas. Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints. **Democracy:** Science is a democratic discipline. When		consistently well with others. • Develop confidence, resilience and knowledge so that they can keep themselves mentally healthy. • An inclusive environment that meets the needs of all pupils, irrespective of age, disability, gender reassignment, race, religion or belief, sex or sexual orientation.

	developing new theories, it has to be accepted by a wide number of scientists before it is consider a scientific theory. Similarly, all experimental work has to be peer reviewed by others before it is accepted. **Individual liberty:** Students have opportunities that will allow them to use their knowledge and understanding to pose scientific questions and define scientific problems. Students are introduced to the idea that Science cannot provide the answers to some questions, for example, where beliefs, opinions and ethics are important.		

Extra-Curricular and Co-Curricular Opportunities	**Links with other subjects in the curriculum**
Lego league Rotary tech challenge Arkwright scholarship Nancy Rothwell award competition Science week activities and poster competition. Kerboodle – additional resources and textbooks	Maths - classifying, counting, measuring, calculating, estimating, tables, graphs, statistics, algebra Geography – Combustion, pollutants, environmental impacts, clean drinking water, product life cycles, climate change. History – structure of the atom, periodic table. Design and technology –properties of metals and metal alloys. Personal development – social and cultural contributions of scientists such as Haber. English and MFL: etymology of words